

NCERQA STAR GRANT ABSTRACT

EPA Grant Number: R827446010

Title: Using Biomarkers of Exposure and Neurobehavioral Test Batteries to Assess Children's Neurological Vulnerability to Residential Exposure to Tetrachloroethene (Perc).

Investigator(s): Judith S. Schreiber, Ph.D., NYSDOH, Principal Investigator
Wanda Lizak Welles, Ph.D., NYSDOH
Stephen M. Levin, M.D., Mt Sinai Medical Center
Kenneth Aldous, Ph.D., NYSDOH

Institution: New York State Department of Health

EPA Project Officer: Chris Saint

Project Period: October 1, 1999 to September 30, 2002

Project Amount: \$610,790

Research Category: Children's Vulnerability to Toxics

Objectives/Hypothesis:

The U.S. EPA considers tetrachloroethene (perc) a problematic pollutant in urban areas. The New York State Department of Health (NYSDOH) has documented high levels of perc in the indoor air of apartments located in the same buildings as dry cleaning facilities in New York State; others have reported this nation- and world-wide. Residents in these buildings are at high risk of acute and chronic health effects from perc exposure at indoor air levels that are well above the acute and chronic minimal risk levels for inhalation. These inadvertent exposures to perc provide a unique opportunity to compare possible neurobehavioral effects in children and adults. The objectives of this study are to: (1) assess perc exposure and neurological vulnerability of children and adults by measuring personal air, and biomarkers of dose in exhaled breath, blood and urine; (2) determine the relationship between environmental perc concentrations and biomarkers of dose; (3) assess neurobehavioral functions in the exposed and control groups; and (4) determine if dose-response relationships exist between the environmental and/or biological measures of exposure and neurological effects using a multilinear regression model with covariants for age, gender and activity levels. Exposed study participants will include 80 residents (40 children, 40 adults) of buildings that contain elevated perc levels from an operating dry cleaning facility; controls will be 80 residents (40 children, 40 adults) who reside in an area without this or other sources of neurotoxicant exposures. The proposed study is consistent with a recommendation by the Children's Health Protection Advisory Committee to U.S. EPA Administrator Carol Browner that the National Emission Standard governing emissions of perc be re-evaluated to determine if it is protective of children's health.

Approach: *Outline the methods, approaches and techniques you intend to employ in meeting the objectives:*

A pilot study by NYSDOH demonstrated elevated perc concentrations in indoor air of study participants' homes in buildings with operating dry cleaners. Elevated perc levels were also found in samples of personal air, breath, blood and urine provided by study participants. Vision tests administered to exposed and control subjects suggest that perc exposure induced spatial and color dysfunction indicative of nervous system effects in exposed building occupants. The proposed study will measure airborne and personal perc exposures in children and adults, determine the internal dose of study participants, evaluate neurobehavioral function for all participants (exposed and control) by using the Adult and Pediatric Environmental Neurobehavioral Test Batteries, and identify correlations.

Expected Results: including **Improvements in Risk Assessment, Risk Management**, etc: which will be obtained if the expected results are achieved

The study will evaluate the neurological function of children and adults exposed to perc. Results of the study will quantify perc exposure for controls and persons residing in buildings with an operating dry cleaning facility using perc; will quantify how characteristics such as age, gender and daily activities affect the internal dose following exposure to known indoor air levels of perc; will assess neurobehavioral effects of exposure to perc for a wide spectrum of sensory, cognitive and motor functions; and will assess dose-response relationships between exposure and neurological functions to identify the earliest signs of perc neurotoxicity and to estimate no-observed-adverse-effect- and lowest-observed-adverse-effect-levels (NOAELs and LOAELs) for these endpoints in children and adults.

The proposed study, focussed on the differences in vulnerability between children and adults and using a comprehensive battery of neurobehavioral tests, will greatly expand our understanding of the neurological health risks associated with perc exposure. It will fill gaps in knowledge about perc exposure that are relevant to meeting current U.S. EPA goals of an integrated urban air toxics strategy. This study will create a data base correlating perc exposure and actual internal body dose metrics of the parent compound and metabolites with neurological effects. This information can be used to assess and compare neurological risk of perc exposure in children and adults, evaluate susceptibility to support human health risk assessment for perc neurotoxicity, and establish/assess a reference concentration (RfC) for perc.

Supplemental Keywords: sensitive populations, solvents, chlorinated compounds, carcinogen.